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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/083,606	02/27/2002	Koudai Yoshizawa	50340-112	7396

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EXAMINER	
ALEJANDRO, RAYMOND	

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 06/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/083,606	YOSHIZAWA ET AL.
	Examiner	Art Unit
	Raymond Alejandro	1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 May 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-53* is/are pending in the application.

4a) Of the above claim(s) *7,9-16,18-28 and 30-53* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6,8,17 and 29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *05/26/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

This office communication is submitted in response to the amendment filed 05/10/04. Refer to the abovementioned amendment for specific details on applicant's rebuttal arguments. However, the instant claims are finally rejected as the 35 USC 102 rejection still stands for the reasons of record:

Election/Restrictions

1. This application contains claims 7, 9-16, 18-28 and 30-53 drawn to an invention nonelected with traverse in the reply filed on 11/24/03. A complete reply to the final rejection must include cancelation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 05/26/04 was considered by the examiner.

Specification

3. The amendment filed 05/10/04 is objected to under 35 U.S.C. 132 because it introduces new matter into the disclosure. 35 U.S.C. 132 states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: (claims 1 and 29) the claim language "*the second protection device/means not returning the drained water to the fuel cell while protecting the fuel cell*" is not

supported by the original disclosure. In this respect, it is noted that the original specification clearly states at paragraph 0051 that "*the thawed water is returned to the inner water tank 4 by the pump 11*". Thus, the drained-thawed water is returned to the fuel cell system. Accordingly, the aforementioned language is unsupported by the original disclosure, and hence, it introduces a new matter issue.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-6, 8, 17 and 29 are rejected under 35 U.S.C. 102(e) as being anticipated by Bonville 6248462.

The present application is directed to a fuel cell system wherein the claimed inventive concept comprises its specific protection devices. Other limitations include the specific protection devices; the thawing device; the porous member; and the controller.

As to claims 1 and 29:

Bonville disclosed an apparatus for thermal management of a fuel cell assembly (TITLE) wherein a plurality of thermal management loops in contact with the fuel cell assembly are

utilized to maintain the fuel cell assembly above freezing or raise the fuel cell assembly above freezing temperature (ABSTRACT).

Figure 3 below shows the fuel cell stack 10, a primary thermal management loop having a cool flow channel in thermal communication with the fuel cell and circulating a coolant; a secondary thermal management loop circulating an antifreeze flow channel spaced along the fuel cell stack; a heat exchanger in thermal communication with the secondary management loop; a thermal management loop controller which regulates said heat exchanger as to maintain said temperature above 32°F (CLAIM 9).

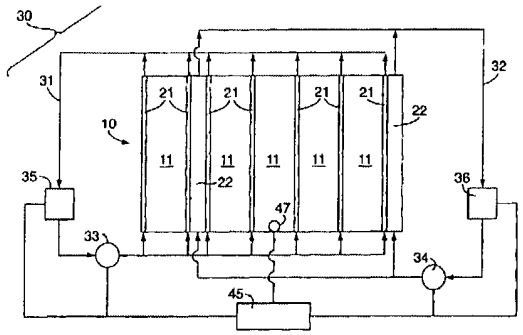

FIG. 3a

It is disclosed that the present invention provides for a dual thermal management loop apparatus having two thermal management loops (COL 9, line 65 to COL 10, line 7). It is further disclosed that the controller 45 controls both the primary and secondary thermal management loops according to a predetermined set of parameters to effect water management as well as ensuring that the fuel cell is not overheated (COL 8, lines 20-30); the controller also regulates the heat exchanger and pump by accepting temperature data from a temperature sensor to ensure that the fuel cell stack does not fall below freezing or alternatively, may be activated at a time after the fuel cell stack has fallen below freezing to quickly bring the fuel cell up above freezing (COL 8, lines 30-41). *Thus, these thermal management loops act as the protection devices for*

preventing freezing of water by maintaining the temperature of the fuel cell and, at the same time, by draining/circulating water therein.

Bonville discloses the apparatus for the thermal management of the electrochemical fuel cell assembly wherein the plurality of thermal management loops in contact with the fuel cell assembly are utilized to maintained the fuel cell assembly above freezing or, alternatively, raise the fuel cell assembly above freezing (ABSTRACT/COL 1, lines 5-12). It is also disclosed that the invention provides a thermal management apparatus for maintaining a fuel cell assembly above freezing (COL 3, lines 1-6/ COL 6, lines 6-12).

(57) **ABSTRACT**

An apparatus for the thermal management of an electrochemical fuel cell assembly, wherein a plurality of thermal management loops in contact with the fuel cell assembly are utilized to maintain the fuel cell assembly above freezing or, alternatively, raise the fuel cell assembly above freezing.

This invention relates in general to a method and apparatus for the thermal management of a fuel cell assembly during times of harsh environmental conditions, and deals more particularly with a method and apparatus by which a fuel cell assembly may be maintained at temperatures above freezing or, alternatively, raised quickly above freezing.

It is another object of the present invention to provide a thermal management apparatus for maintaining a fuel cell assembly above freezing.

It is another object of the present invention to provide a thermal management apparatus for raising the temperature of a fuel cell assembly above freezing in a rapid fashion.

or other structure within the fuel cell stack **10**. Additionally, even if the actual freezing of the fuel cell stack **10** does not cause inoperative damage, a problem still exists in that the start-up time of a frozen fuel cell stack **10** is unduly long. It would therefore be very beneficial to equip a fuel cell stack **10** with an apparatus which may maintain the fuel cell stack **10** above 32° F., or alternatively, quickly raise the temperature of a frozen fuel cell stack **10** so as to rapidly enable operation of the fuel cell stack **10**.

It is also disclosed that the primary thermal management loop serves to address two main concerns of an operating fuel cell assembly: the water management of the fuel cell assembly as

well as the thermal management of a fuel cell assembly (COL 4, line 65 to COL 5, line 5). It is disclosed that the primary thermal management loop circulates a coolant and is in diffusible communication with the fuel cell stack while the secondary thermal management loop circulates the antifreeze solution at locations between the fuel cell assemblies along the fuel cell stack (COL 3, lines 20-27).

> The primary thermal management loop circulates a coolant and is in diffusable communication with the fuel cell stack, while the secondary thermal management loop circulates an antifreeze solution and is diffusably isolated from the fuel cell stack. The secondary thermal management loop circulates the antifreeze solution at interspersed locations between the fuel cell assemblies along the fuel cell stack.

It is further taught that coolant channels are provided for carrying away excessive water from the fuel cell (COL 2, lines 45-50). That is, it provides an effective cooling system for an operational fuel cell assembly while also ensuring that excessive water is transported away (COL 2, lines 65-67). It is disclosed that any excess water is purged from the cathode 14 (COL 5, lines 45-50).

> It is another object of the present invention to provide an effective cooling system for an operational fuel cell assembly while also ensuring that excessive water is transported away.

> **20** as well as the PEM **13**. In this manner, through a judicious balance of the pressures within the oxidant channels **19** and the fuel channels **20**, the coolant channels **21** serve to provide an adequate supply of water at the anode **15**, insuring the hydration of the PEM **13** and purging any excess water built up at the cathode **14**.

It is also disclosed that the primary thermal management loop provides regulation to the coolant flow within the fuel cell stack by supplying the fuel cell stack with a supply of water coolant which passes through the fuel cell stack (COL 7, lines 31-55). Similarly, the secondary

thermal management loop also services the fuel cell stack providing regulation to the antifreeze solution flowing through each of the cooler plates by supplying the fuel cell stack with a supply of an antifreeze solution which passes therethrough and transfer a portion of its heat to the fuel cell assemblies; wherein heat is added by employing the heat exchanger 36 (COL 7, line 57 to COL 8, line 13/COL 6, lines 27-40). *Thus, these thermal management loops act as the protection devices for preventing freezing of water by maintaining the temperature of the fuel cell and, at the same time, by draining/circulating water therein.*

Examiner's note: *the claim language "first protection means which prevents...", "second protection means which prevents..." and "means which select..." have not been construed as invoking the 35 USC 112, 6th paragraph because they do not meet the 3-prong analysis conditions as set forth in MPEP 2181.*

Regarding claims 2 and 4:

Bonville teaches the use of a heat exchanger employing an electric or fossil heating source wherein, in this manner, temperature of the fuel cell stack is maintained or raised above freezing (COL 7, lines 25-30/COL 8, lines 4-14/COL 6, lines 1-12).

As for claim 3:

It is disclosed that the thermal management loops are isolated (ABSTRACT/ COL 10, lines 15-20)

With reference to claim 5:

It is also disclosed that the primary thermal management loop provides regulation to the coolant flow within the fuel cell stack by supplying the fuel cell stack with a supply of water coolant which passes through the fuel cell stack absorbing heat; wherein these heated coolant

flows are then exhausted from the fuel cell stack (COL 7, lines 31-46). *Thus, the exhausted water is drained and collected in the fuel cell system.*

As to claim 6:

It is disclosed that the fuel cell can be equipped with an apparatus which maintain the fuel cell stack above freezing temperature, or alternatively, quickly raise the temperature of a frozen fuel cell stack so as to rapidly enable operation of the fuel cell (COL 6, lines 7-12) wherein melting of the fuel cell is achieved (COL 6, lines 42-65). *Hence, this feature acts as the thawing device.*

As to claim 8:

Bonville also teaches the fuel cell assembly have a natural tendency to diffuse through a porous material of the cathode flow field plate and into the coolant channels (COL 5, lines 33-40). *Thus, a porous member is located on the water and gas passages.*

On the matter of claim 17:

Bonville makes known that controller 45 controls both the primary and secondary thermal management loops according to a predetermined set of parameters to effect water management as well as ensuring that the fuel cell is not overheated (COL 8, lines 20-30). *Thus, the controller functions to select the both protection devices.*

Therefore, the claims are still anticipated.

Response to Arguments

6. Applicant's arguments filed 05/10/04 have been fully considered but they are not persuasive. The main contention of applicants' arguments is premised on the assertion that the

prior art of record fails to "disclose the first and second protection devices or means which prevent freezing of water in fuel cell". However, this assertion is respectfully disagreed with because the prior art clearly teaches the following:

a) the prior art discloses the apparatus for the thermal management of the electrochemical fuel cell assembly wherein the plurality of thermal management loops in contact with the fuel cell assembly are utilized to maintained the fuel cell assembly above freezing or, alternatively, raise the fuel cell assembly above freezing (Bonville ABSTRACT/COL 1, lines 5-12);

b) It is also disclosed that the invention provides a thermal management apparatus for maintaining a fuel cell assembly above freezing (Bonville COL 3, lines 1-6/ COL 6, lines 6-12);

(57) **ABSTRACT**

An apparatus for the thermal management of an electrochemical fuel cell assembly, wherein a plurality of thermal management loops in contact with the fuel cell assembly are utilized to maintain the fuel cell assembly above freezing or, alternatively, raise the fuel cell assembly above freezing.

This invention relates in general to a method and apparatus for the thermal management of a fuel cell assembly during times of harsh environmental conditions, and deals more particularly with a method and apparatus by which a fuel cell assembly may be maintained at temperatures above freezing or, alternatively, raised quickly above freezing.

It is another object of the present invention to provide a thermal management apparatus for maintaining a fuel cell assembly above freezing.

It is another object of the present invention to provide a thermal management apparatus for raising the temperature of a fuel cell assembly above freezing in a rapid fashion.

or other structure within the fuel cell stack **10**. Additionally, even if the actual freezing of the fuel cell stack **10** does not cause inoperative damage, a problem still exists in that the start-up time of a frozen fuel cell stack **10** is unduly long. It would therefore be very beneficial to equip a fuel cell stack **10** with an apparatus which may maintain the fuel cell stack **10** above 32° F., or alternatively, quickly raise the temperature of a frozen fuel cell stack **10** so as to rapidly enable operation of the fuel cell stack **10**.

c) the prior art also discloses that the primary thermal management loop serves to address two main concerns of an operating fuel cell assembly: the water management of the fuel cell assembly as well as the thermal management of a fuel cell assembly (Bonville COL 4, line 65 to COL 5, line 5);

d) the prior art further reveals tat the primary thermal management loop circulates a coolant and is in diffusible communication with the fuel cell stack while the secondary thermal management loop circulates the antifreeze solution at locations between the fuel cell assemblies along the fuel cell stack (Bonville COL 3, lines 20-27).

> The primary thermal management loop circulates a coolant and is in diffusable communication with the fuel cell stack, while the secondary thermal management loop circulates an antifreeze solution and is diffusably isolated from the fuel cell stack. The secondary thermal management loop circulates the antifreeze solution at interspersed locations between the fuel cell assemblies along the fuel cell stack.

Having shown what the prior art divulges, the examiner fairly contend that the prior art provides for a dual thermal management loop apparatus having two thermal management loops wherein each of the thermal management loops is in thermal communication with one another and the fuel cell stack. Therefore, the synergistic effect of having combined both thermal management loop provides effective first and second protection devices or means which prevent freezing of water in fuel cell so as to achieve the necessary functional interrelationship to satisfy the claimed requirement of preventing freezing of water in the fuel cell: by maintaining the temperature of the fuel cell, and by draining water in the fuel cell and not returning it to the fuel cell.

7. Applicants have also argued that the primary thermal management loop of Bonville does not prevent freezing of the fuel cell stack as the thermal management loop circulates coolant so that heat generated in the fuel cell stack is absorbed, in this regard it contended (again) that the synergistic effect of having combined both thermal management loop provides effective first and second protection devices or means which prevent freezing of water in fuel cell so as to achieve the necessary functional interrelationship to satisfy the claimed requirement of preventing freezing of water in the fuel cell: by maintaining the temperature of the fuel cell, and by draining water in the fuel cell and not returning it to the fuel cell. In addition, it is noted that the thermal management loop circulating coolant satisfies, at least, the requirement of maintaining the temperature of the fuel cell within a desirable temperature range. Furthermore, the present claims does not specifically set forth whether freezing is prevented by a cooling thermal cycle or a heating thermal cycle, that is to say, the claim language simply recites preventing "freezing of water in the fuel cell by maintaining the temperature of the fuel cell"; and that's exactly what Bonville's coolant management loop does. Thus, absent further description of the specific structure/functionality of the first protection device or thermal loop, the examiner contends that the thermal management loop of Bonville is capable of maintaining the fuel cell assembly above freezing or alternatively, raise the fuel cell assembly temperature above freezing temperature. Accordingly, the examiner is giving the claim language its reasonable broadest interpretation in the same manner that applicants are claiming the invention in its broadest extensive embodiment.

8. As to the assertion that the prior art does not disclose the second protection device/means which prevents freezing of water in the fuel cell by draining water in the fuel cell and not returning the drained water to the fuel cell while protecting the fuel cell, the examiner first like to assert that applicants, in fact, admitted that the prior art discloses "*immediately returning water that is exhausted from the fuel cell stack back through the fuel cell stack after the water passes through the heat exchangers 35 and 36*" (see amendment of 05/10/04 at page 16, 2nd full paragraph). In that, it is contended that said argument, to some extent, positively states that exhausted water is returned to the fuel cell *only after* the water has been thermally treated in heat exchangers. As a result, it satisfies the claimed requirement of "not returning the drained water to the fuel cell while protecting the fuel cell". Stated somewhat differently, while the heat exchangers perform their function of heat treating the exhausted water, the fuel cell is being thermally protected by that very same function of the heat exchanger and thermal loop of Bonville, consequently, water is removed and treated in the heat exchangers and not returned to the fuel cell to prevent freezing. Since the instant claims are silent as to the specific time length of the protecting function or whether or not the drained water is immediately or not immediately returned thereto, it is also asserted that the prior art's thermal management loops provide the necessary functional interrelationship to meet the claimed functional language. Accordingly, the examiner is giving the claim language its reasonable broadest interpretation in the same manner that applicants are claiming the invention in its broadest extensive embodiment.

Moreover, the foregoing assertion (*i.e. the prior art not disclosing the second protection device/means which prevents freezing of water in the fuel cell by draining water in the fuel cell*

and not returning the drained water to the fuel cell while protecting the fuel cell) is also respectfully disagreed with because the prior art clearly teaches the following:

i) that coolant channels are provided for carrying away excessive water from the fuel cell (Bonville COL 2, lines 45-50).

ii) it provides an effective cooling system for an operational fuel cell assembly while also ensuring that excessive water is transported away (Bonville COL 2, lines 65-67).

iii) that any excess water is purged from the cathode 14 (Bonville COL 5, lines 45-50).

It is another object of the present invention to provide an effective cooling system for an operational fuel cell assembly while also ensuring that excessive water is transported away.

20 as well as the PEM **13**. In this manner, through a judicious balance of the pressures within the oxidant channels **19** and the fuel channels **20**, the coolant channels **21** serve to provide an adequate supply of water at the anode **15**, insuring the hydration of the PEM **13** and purging any excess water built up at the cathode **14**.

9. Applicant's arguments fail to comply with 37 CFR 1.111(b) because they amount to a general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references.

10. Applicant's arguments do not comply with 37 CFR 1.111(c) because they do not clearly point out the patentable novelty which he or she thinks the claims present in view of the state of the art disclosed by the references cited or the objections made. Further, they do not show how the amendments avoid such references or objections.

Conclusion

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro
Examiner
Art Unit 1745